EXPERIMENT-9

MOSFET AMPLIFIER

AIM: To design amplifier MOSFET with following specifications and to study the frequency response of amplifier, calculate voltage gain and bandwidth from the response.

OBJECTIVES:

1. Design a MOSFET amplifier for given specifications.
2. Simulate the designed amplifier.
3. Develop the hardware for designed amplifier.
4. Compare simulated results with practical results.

APPARATUS:

S.No.	Name of the Component/ Equipment	Specifications	Quantity
1	MOSFET (2N 7000)	Icmax=100mA PD=300mw Vceo=45V Vbeo=50V	1
2	Capacitors (designed values)	Electrolytic type, Voltage rating= 1.6V	3
3	Resistors (designed values)	Power Rating =0.5 W Carbon type	4
4	Function Generator	(0 -1) MHZ	1
5	Cathode Ray Oscilloscope	20 MHZ	1
6	Regulated Power Supply	(0-30) V,1Amp	1

THEORY:

MOSFET stands for metal-oxide-semiconductor field-effect transistor. It is a field-effect transistor with a MOS structure. Typically, the MOSFET is a four-terminal device with gate (G), drain (D) ,source (S),body terminal.

MOSFET is voltage controlled current device.

MOSFET has an advantage over BJT ,that it is has good thermal stability and input current to MOSFET is zero because it has metal oxide layer, it will not allow current to flow into MOSFET through it .

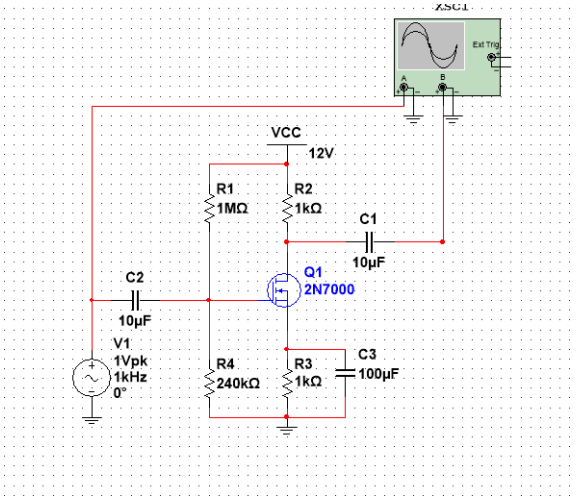
MOSFET terminals are interchangeable.

SOFTWARE SIMULATION:

Procedure:

1. Switch ON the computer and open the multisim software
2. Observe Design tool box, Instrumentation tool box, component tool box and its component functionality
3. From above tool boxes,
   Connect the circuit using the designed values of each and every component
4. Connect the function generator with sine as input at the input terminals of the circuit. (Or) use signal source.
5. Connect the Cathode Ray Oscilloscope (CRO) to the output and input terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. From the CRO note the following values1.
   - Input voltage V_i , Output voltage Vout, Voltage Gain Av, Phase Shift
8. To study the frequency response use, Bode platter and calculate bandwidth.

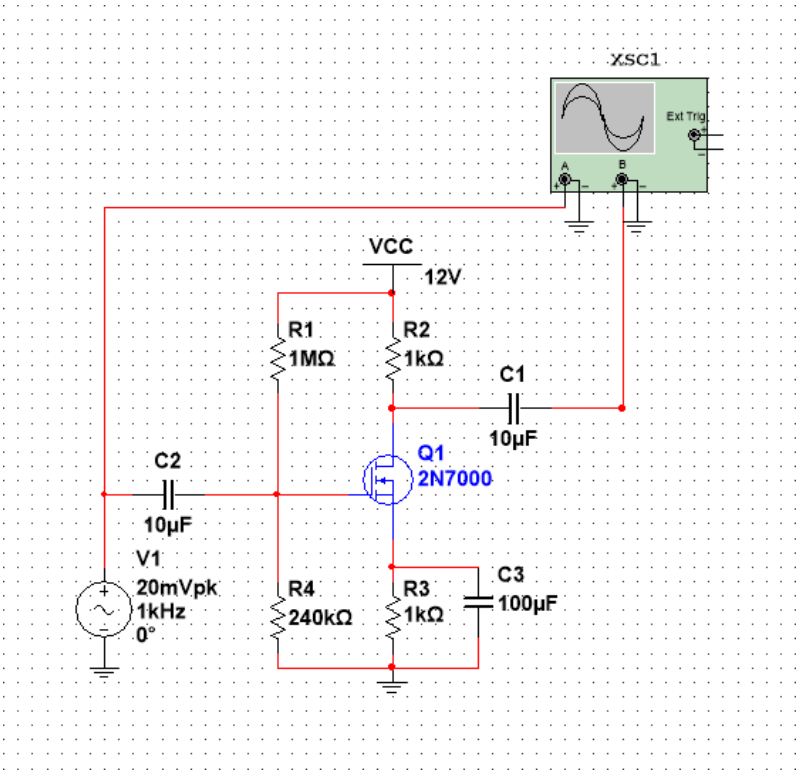
MOSFET Amplifier:



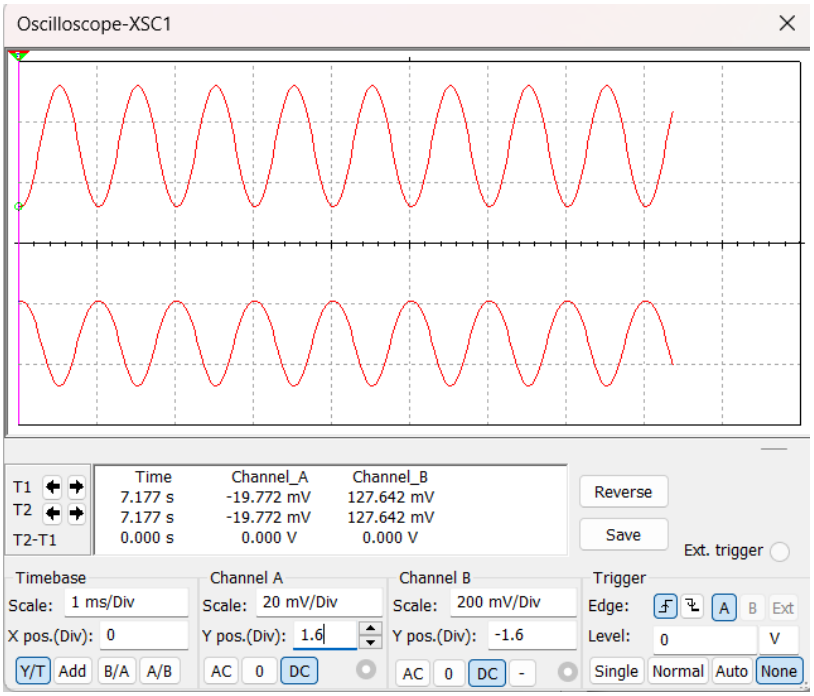
Input and output waveforms:

- For faithfull output we need to decrease the strength of the input signal

MOSFET amplifier with input 20mV p-p:



Input and output waveforms:



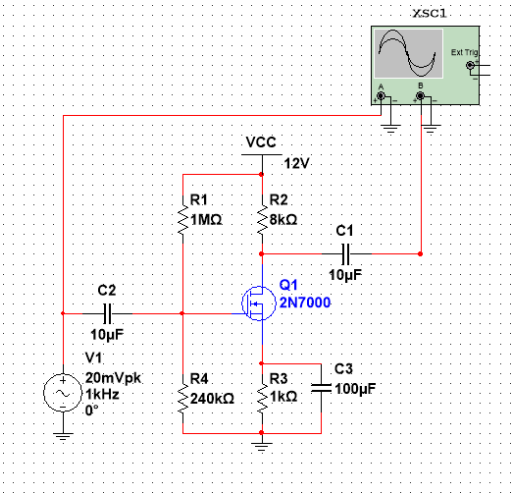
Input voltage:

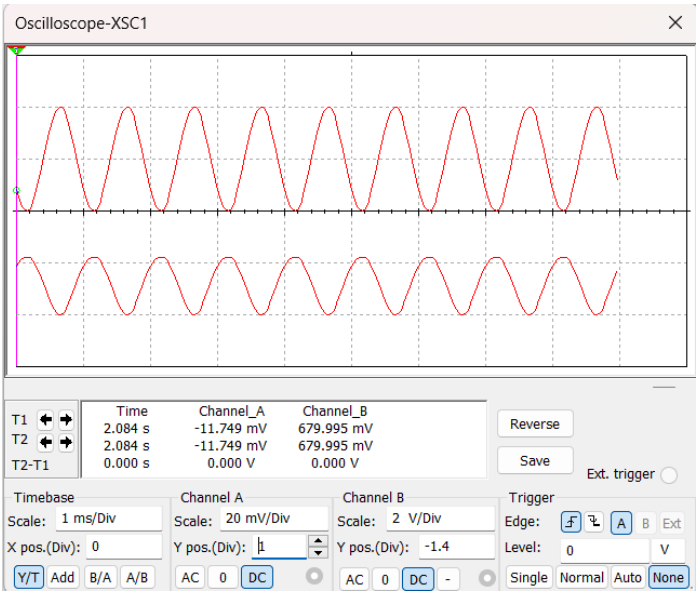
Output voltage:

Gain:

- To increase the gain of MOSFET amplifer we need to increase the Rd(R2) resistance value

Case 1:
Rd=8k





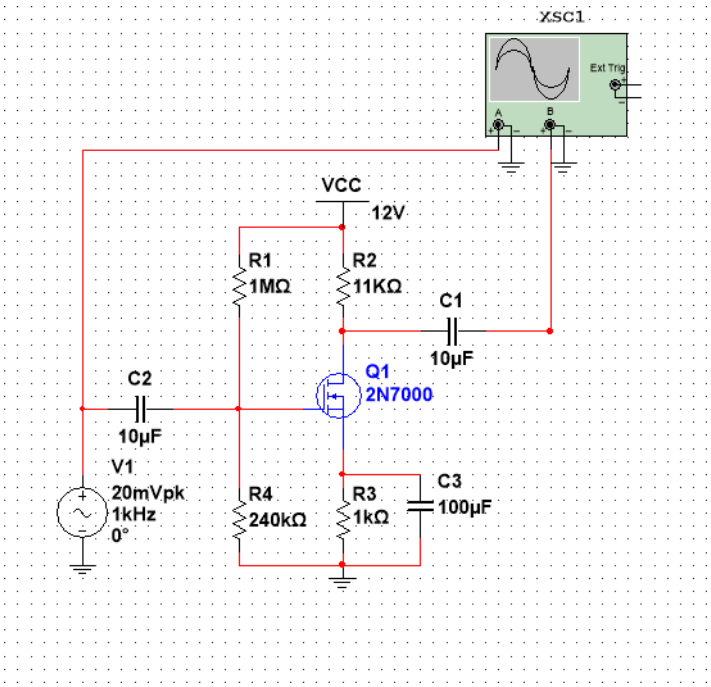
Input voltage:

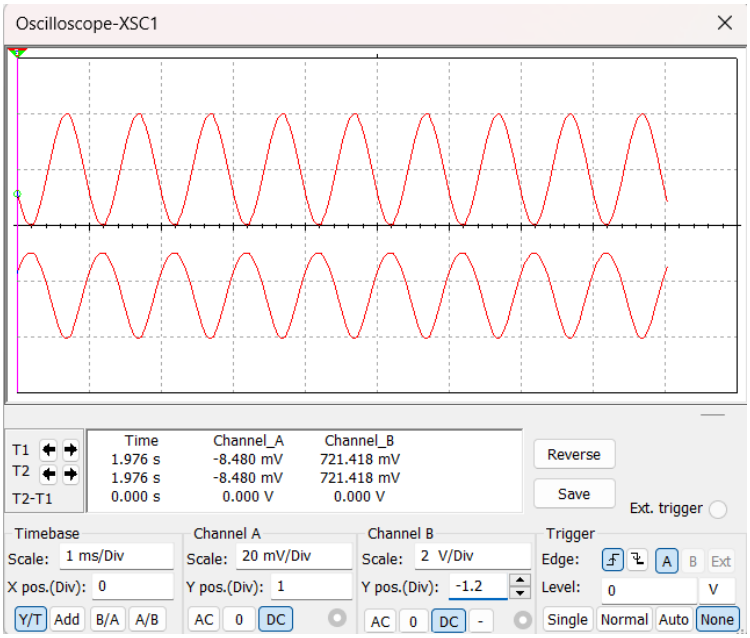
Output voltage:

Gain:

Case 2:

Rd=11K:





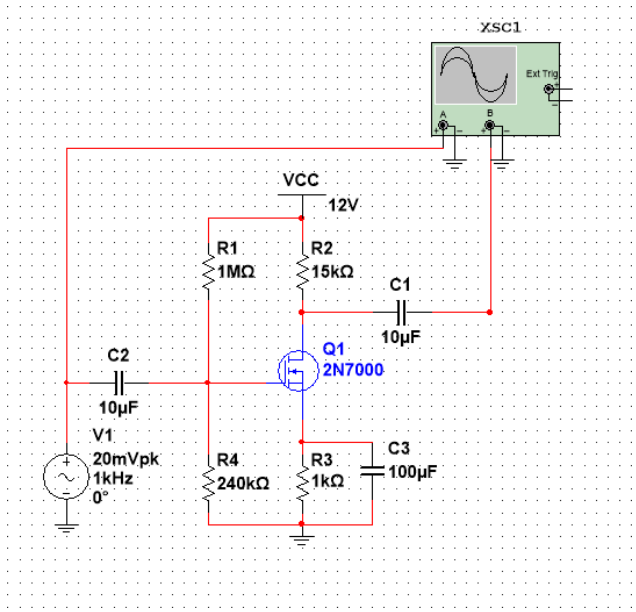
Input voltage:

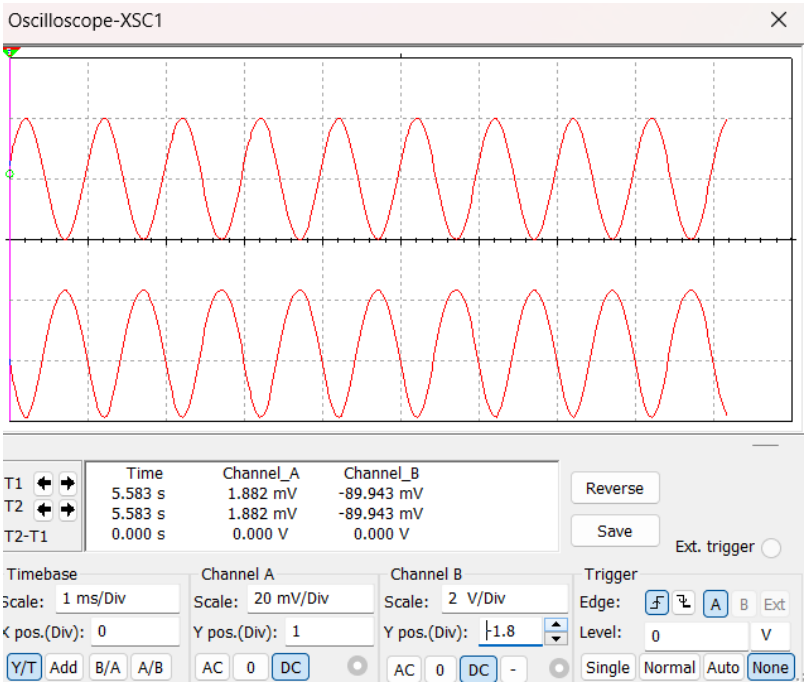
Output voltage:

Gain:

Case 3:

Rd=15k:



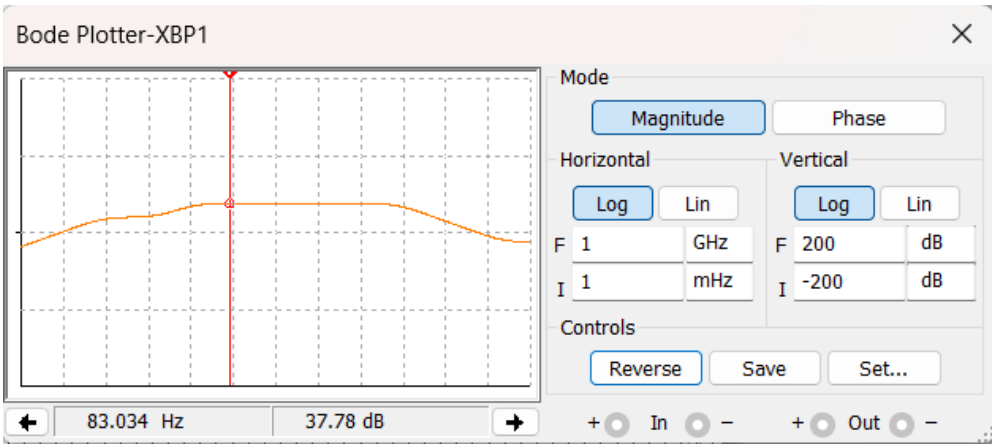


Input voltage:

Output voltage:

Gain:

Frequency response for MOSFET amplifier (Rd=11k):



Hardware simulation:

1. Connect the circuit as per the circuit diagram.

2. Apply the supply voltage, VCC=12V

3. Make sure that the transistor is operating in the active region by keeping VCE half of VCC.

4. Now feed an ac signal of 20mV at the input of the amplifier with different frequencies ranging from 100 HZ

to 300 MHZ and measure the amplifier output voltage.

5. Now calculate the gain in decibels at various input signal frequencies.

6. Draw a graph with frequencies on the X-axis and gain in dBs on the Y-axis. From the graph calculate

Bandwidth.

OBSERVATION:

Frequency (Hz)	Input Voltage	Output Voltage (V)	Gain (dB)
10	160mV	1.6	20
30	400mV	1.2	9.54
50	370mV	1.0	8.63
100	700mV	1.0	3.0
500	1.96	12.9	16.3
1K	1.91	13.1	16.72
2K	1.91	12.9	16.59
3K	1.96	13.1	16.5
10K	1.91	12.9	16.5
20K	1.96	13.1	16.5
50K	1.97	12.9	16.3